Prevalence and its Antibacterial Susceptibility Pattern of Asymptomatic Bacteriuria in Pregnancy

Smriti Sinha[1], Pritee Kumari[2], Shashi Bala Prasad[3]

[1]Assistant Professor, Department of Obstetrics and Gynaecology, Madhubani Medical College and Hospital, Madhubani, Bihar.

[2]Postgraduate Student (Final Year), Department of Microbiology, Narayana Medical College, Jamuhar, Sasaram, Bihar.

[3]Professor, Department of Obstetrics and Gynaecology, Madhubani Medical College and Hospital, Madhubani, Bihar.

Abstract

Background: Pregnant women often have asymptomatic and symptomatic bacteriuria (ASB). The transition from asymptomatic to symptomatic bacteriuria is accelerated during pregnancy. If managed, this can result in acute pyelonephritis as well as other unfavorable consequences such preterm, postpartum, hypertensive disease, anemia, urinary tract infections, and increased chances of fetal mortality. The purpose of this study was to determine the most frequent bacteria and their susceptibility to antibiotics in pregnant women, as well as to assess the prevalence and risk factors of asymptomatic bacteriuria.

Methods: From February 2023 to September 2023, 230 pregnant women in good health who made their first appointment at the antenatal outpatient department at MMCH, Madhubani, Bihar, had their bacteriuria assessed.

Results: Ten percent of pregnant women had asymptomatic bacteriuria. Except for those living in rural areas, demographic and obstetric factors had no discernible impact on the frequency of asymptomatic bacteriuria ($\chi2$=4.454, p=0.0348). 52.17% of the microorganisms were Escherichia coli. Amoxicillin, cotrimoxazole, ampicillin, nalidixic acid, and aminoglycosides all cause less sensitivity in uropathogens than imipenem and aminoglycosides.

Conclusion: In the study, pregnant women had a significant rate of asymptomatic bacteriuria. Demographic and obstetric characteristics did not significantly affect the risk of ASB, with the exception of living in a rural area. Thus, in our setting, routine asymptomatic bacteriuria screening for expectant mothers is advised.

Keywords: Pregnancy, asymptomatic bacteriuria, urine culture, antibiotic sensitivity.

Introduction

In patients who do not exhibit overt urine symptoms, asymptomatic bacteriuria (ASB or Asymptomatic Significant bacteriuria) is characterized as the presence of actively proliferating bacteria in the urinary system, excluding the distal urethra [1]. The prevalence ranges from 4% to 7% and is comparable to that of non-pregnant women. [2,3] Lower socioeconomic strata, a history of asymptomatic UTIs, high parity, and ages are associated with an increased prevalence of ASB. [4,5] A specific quantitative number of bacteria isolated from a urine specimen is the basis for the microbiological diagnostic known as ASB. Urine culture is therefore the gold standard for ASB screening. Nearly 60%–90% of cases include isolated Escherichia coli.

Proteus mirabilis, Klebsiella pneumoniae, Enterococcus, Group B beta-haemolytic streptococci, Staphylococcus saprophyticus, and other common agents are also present. [6, 7] variable regions may have variable rates of isolated infections and patterns of antibiotic susceptibility. The most prevalent pathogens in a given area should be identified, and the population should be informed about those organisms' patterns of antibiotic susceptibility. Therefore, the purpose of this study was to look at the antibacterial susceptibilities of the isolated microorganisms, the common microorganisms identified, and the prevalence and risk factors of ASB among pregnant women who visited the tertiary care center.

Material and Methods

From February to September of 2023, a cross-sectional study was conducted in the departments of obstetrics & gynecology and microbiology at Madhubani Medical College and Hospital in Madhubani, Bihar. Every pregnant woman who

participated gave her informed consent. Women who visited the antenatal clinic for the first time, regardless of gestational age, were included in the study. However, women who had previously received antibiotics within the past seven days, had a history of urinary tract symptoms (dysuria, frequency, urgency, etc.), had pyrexia of unknown origin, or had recurrent UTIs were not.

Data were presented as numbers and percentages in tables. Chi square or Fisher's exact tests were used to test for associations. Significant association was presumed if P < 0.05.

Results

A 10% prevalence of severe bacteriuria was found in 23 out of the 230 pregnant women who had ASB examination. Table 1 displays the impact of the participants' age, parity, location, educational attainment, and gestational age on ASB. The age group of 20–30 years old had the highest rate of 10.40%, while the group of those over 30 years old had the lowest rate of 7.69%. The prevalence connection between the age group and chi square value (0.1488, df=2, p=0.9283) is not statistically significant. Among women with substantial bacteriuria positivity, nulliparous women had the highest prevalence (11.81%), whereas women with one or two children had the lowest prevalence. On the other hand, parity and prevalence did not significantly correlate ($\chi2 = 1.038$, df=2, p=0.5950). There was a statistically significant (p<0.05) increase in the likelihood of ASB among pregnant women who lived in rural areas. But there was no meaningful correlation found between ASB and educational attainment. According to trimester, the prevalence of asymptomatic bacteriuria was as follows: first trimester: 3 (8.11%), second trimester: 9 (10.98%), and third trimester: 11 (9.91%). However, there was no discernible relationship between ASB and pregnant trimester ($\chi2 = 0.2349$, df=2, p=0.8892).

Table 1: Prevalence of asymptomatic bacteriuria among pregnant women

Variables	Significant bacteriuria N (%)	No significant bacteriuria N (%)	Total number of cases (%)	χ^2	Df	p-value
Age in years • <20 • 20-30 • >30	4(9.09%) 18(10.40%) 1(7.69%)	40(90.91%) 155(89.60%) 12(92.31%)	44(100%) 173(100%) 13(100%)	0.1488	2	0.9283
Parity • 0 • 1-2 • >3	15(11.81%) 7(7.69%) 1(8.33%)	112(88.19%) 84(92.31%) 11(91.67%)	127(100%) 91(100%) 12(100%)	1.038	2	0.5950
Locality • Rural • Urban	21(13.04%) 2(2.89%)	140(86.96%) 67(67.11%)	161(100%) 69(100%)	4.454	1	0.0348*
Literacy • Illiterate • Primary • High school • Higher education	3(9.09%) 10(10.64%) 8(10.39%) 2(7.69%)	30(90.91%) 84(89.36%) 69(89.61%) 24(92.31%)	33(100%) 94(100%) 77(100%) 26(100%)	0.2397	3	0.9709
Gestational Age • 1st trimester • 2nd trimester • 3rd trimester	3(8.11%) 9(10.98%) 11(9.91%)	34(91.89%) 73(89.02%) 100(90.09%)	37(100%) 82(100%) 111(100%)	0.2349	2	0.8892

*P < 0.05 – statistically significant, $\chi 2$ – chi-square test, df- degrees of freedom

Table 2 displays the bacterial isolates. E. Coli (52.17%) was the most common bacteria, followed by Enterococcus faecalis (8.69%), Staphylococcus aureus (17.39%), and Klebsiella pneumoniae (21.73%). Table 3 lists the isolates' susceptibilities to antibiotics.

Table 2 : Bacterial isolates among pregnant women with significant bacteriuria

Bacterial isolates	No. of women	Isolate percentage
Escherichia coli	12	52.17%
Staphylococcus aureus	4	17.39%
Enterococcus faecalis	2	8.69%
Klebsiella pneumoniae	5	21.73%
Total	23	100%

Table 3: Antimicrobial susceptibility pattern

Drugs	E. coli N (%)	S. aureus N (%)	E. faecalis N (%)	Klebsiella N (%)
Ciprofloxacin	9(75%)	4(100%)	0	4(80%)
Nitrofurantoin	10(83.33%)	ND	1(50%)	4(80%)
Nalidoxic acid	6(50%)	ND	ND	3(60%)
Cefepime	11(91.67%)	3(75%)	ND	5(100%)
Amikacin	11(91.67%)	3(75%)	2(100%)	5(100%)
Ampicillin	7(58.33%)	ND	1(50%)	3(60%)
Amoxicillin	8(66.67%)	2(50%)	2(100%)	4(80%)
Cotrimoxazole	7(41.67%)	3(75%)	1(50%)	3(60%)
Doxycyclin	9(75%)	2(50%)	2(100%)	4(80%)
Azithromycin	ND	4(100%)	2(100%)	ND
Gentamicin	10(83.33%)	ND	2(100%)	5(100%)
Tobramycin	ND	ND	ND	5(100%)
Vancomycin	ND	4(100%)	2(100%)	ND
Imipenem	12(100%)	4(100%)	ND	5(100%)

The most prevalent isolate, E. coli, was shown to have a 41.67% sensitivity to cotrimoxazole and a 50% sensitivity to nalidoxic acid acid. A sensitivity of 75% was noted for ciprofloxacin and doxycycline. 83.33% of the population was sensitive to nitrofurantoin and gentamicin, and 91.67% was sensitive to cefepime and amikacin. For imipenem, a sensitivity of 100% was discovered.

The second most common isolate, Klebsiella pneumoniae, had a 60% sensitivity to ampicillin, cotrimoxazole, and nalidoxic acid. Sensitivity to cefepime, amikacin, gentamicin, tobramycin, and imipenem was 100%, while that to amoxycillin, ciprofloxacin, nitrofurantoin, and doxycyclin was 80%.

Three (75%) of the Staphylococcus aureus isolates were responsive to cefepime, amikacin, and cotrimoxazole, while two (50%) were sensitive to amoxicillin and doxycycline. All of the isolates were susceptible to ciprofloxacin, azithromycin, vancomycin, and imipenem. Amoxicillin, amikacin, doxycyclin, gentamicin, azithromycin, and vancomycin were all effective treatments for the Enterococcus faecalis isolates; ciprofloxacin, ampicillin, nitrofurantoin, and cotrimoxazole did not work on any of the isolates.

Discussion

10% of pregnant women in this study had asymptomatic bacteriuria, which was nearly identical to the 9.5% reported from a study conducted in Kumasi, Ghana [8- 12]. It is less than the 13.5% that Mangalore, Karnataka, reported. [13] 17% reported in Nellore, India; 26% in Chitwan, Nepal; and so on [14-15]. This is greater than the 7.3% found in the Kanpur, India study [16].

The age group of 20 to 30 years old had the highest prevalence (10.40%), while the age group of those over 30 years old had the lowest percentage (7.69%).

Regarding age group, there was no discernible variation in the prevalence of ASB (P = 0.6597). In a study conducted by Imade PE et al. (2017), 1228 pregnant women were assessed, and the largest prevalence was noted in the 20–30 age range, which is similar to the current findings. In contrast to our findings, a study conducted in Ghana that involved 220 pregnant women found that the age group of >35 years old had the highest prevalence of ASB[18]. When it came to parity, the prevalence of nulliparous women was 11.81%, compared to 7.69% for those with parity of 1 or 2. This study parity distribution didn't seem to have a big impact on ASB. This study is comparable to earlier findings from Ghana [12] and Nigeria [16-19]. This, however, was not the case in another study where ASB during pregnancy was linked to an increase in parity [20, 21].

The study conclusions show that there was a substantially greater prevalence of ASB in rural than in urban areas (χ^2 = 4.454, df=1, p=0.0348). A similar result was noted in Onu FA et al. investigation. [22] There was no discernible correlation between asymptomatic bacteriuria and educational status, which is measured by socioeconomic position. This result was similar to the Labi et al. study. [23] The results, however, were inconsistent with those from southeast Nigeria, where ASB was primarily observed in women with the lowest levels of education. [24] Similar to the findings of Nath et al. study, a higher prevalence of ASB was observed in the second trimester of pregnancy in this investigation. [25]

The study predominant organism was Escherichia coli, which was followed by Staphylococcus aureus. Enterococcus faecalis and Klebsiella pneumoniae were the other species that were isolated. The results of earlier research by Umamageswari [26], Chandel [27], and Gayathree [28,29] are comparable to this.

The highest levels of antibiotic sensitivity demonstrated by the uropathogens in this investigation were as follows: 100% of E. Coli, 100% of S. Aureus, 100% of K. pneumoniae, 100% of imipenem, 100% of tobramycin, 100% of gentamicin, 100% of amikacin, and 100% of cefepime; 100% of E. faecalis, 100% of vancomycin, 100% of azithromycin, 100% of gentamicin, doxycyclin, 100% of amikacin, and 100% of amoxicillin. Amoxicillin, cotrimoxazole, ampicillin, and nalidoxic acid showed the least sensitivity against the uropathogens. Drug availability, cheap cost, self-medication, and antibiotic abuse are possible causes of resistance to these. Despite the fact that the indiscriminate use of antibiotics causes differences in the sensitivity and resistance pattern of antibiotics between communities and hospitals, our study is consistent with other studies 16, 29 that have found that various uropathogens remain highly sensitive to imipenem and aminoglycosides.

Conclusion

Ten percent of the pregnant women in this study had asymptomatic bacteriuria. Demographic and obstetric factors did not significantly affect the prevalence of asymptomatic bacteriuria, with the exception of living in a rural area. The most common organisms are E. Coli, and the majority of isolates are imipenem and aminoglycoside sensitive. Rather than offering empirical therapy, it is crucial to educate doctors on the proper use of antibiotics in light of the evolving patterns of bacterial resistance to conventional medications.

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